INTELLIGENT TELEVISION RECEIVER AND METHOD OF PROCESSING DATA THEREIN

BACKGROUND OF THE INVENTION

The present invention relates to an intelligent television receiver operable with a communication information service transmitted through a value added network (VAN) and method of processing information data in the intelligent television receiver.

In general, a television receiver receives a radio frequency (RF) signal transmitted from a broadcasting station or via a cable. General purpose personal computers can be also connected to receive such signals.

A computer may further provide communication functions to receive various kinds of communication services transmitted via the VAN. Such communication services include transmission of information communication data (hereinafter referred to as "information data") on stock market quotes, news, weather or television information. In the present invention, the computer communication function is incorporated into the television receiver so that even persons inexperienced with computers can easily use the various communication services.

SUMMARY OF THE INVENTION

Therefore, it is a first object of the present invention to provide an intelligent television receiver which can receive a communication service by connection through a telephone line to a value added network (VAN).

It is a second object of the present invention to provide an intelligent television receiver having a communication karaoke function.

It is a third object of the present invention to provide an intelligent television receiver for outputting background music during a television mode-to-communication mode conversion.

It is a fourth object of the present invention to provide an intelligent television receiver for outputting an audio message indicating no answer when a called party does not respond to an incoming signal.

It is a fifth object of the present invention to provide an intelligent television receiver which can be used in an expanded capability mode when a communication mode is selected.

It is a sixth object of the present invention to provide a method for processing information data received in an intelligent television receiver.

It is a seventh object of the present invention to provide a method for processing information data for a communication karaoke mode received in an intelligent television receiver.

It is an eighth object of the present invention to provide a method for preventing the calculation of transmission costs for song data which includes a reception error generated in a communication karaoke mode of an intelligent television receiver.

To accomplish the above objects, there is provided an intelligent television receiver comprising: a modem for transmitting and receiving information data according to connection command data while connected with a value added network (VAN) via a communication cable; and an information processing unit for outputting the connection command data if a communication mode is set, decoding the

nformation data transmitted from the modem to display the nformation data on a CRT and transmitting command data ecessary for the transmission and reception of the infor- nation data to the modem.

According to another aspect of the present invention, nere is provided an information data processing method for n intelligent television receiver for receiving a signal of a esired channel to be displayed on a CRT and receiving nformation data of a graphic or text state, provided through value added network (VAN), and decoding the received ata, the method comprising the steps of: (a) setting a ommunication mode; (b) selecting a communication item if he communication mode is set; (c) connecting the intelli- ent television to the VAN if the communication item is elected; (d) receiving information data depending on the elected communication item if the intelligent television is onnected with the VAN; (e) determining whether an error s generated in the received data; (f) requesting retransmis- ıon of the information data if an error is generated in the eceived data in the step (e); (g) decoding the received data f an error is not generated in the received data in the step (e); h) displaying the decoded data on the CRT; (i) checking a ommand depending on key inputs concurrent with the step h); (j) transmitting the command checked in said step (i) to ne VAN if the command is concerned with a communica- on mode; and (k) disconnecting a line and converting the perating mode of the intelligent television into a television node if the command is a connection completion command.

Also, according to still another aspect of the present nvention, there is provided an information data processing nethod for a communication karaoke mode of an intelligent elevision receiver for transmitting and receiving informa- on data from a value added network, the method compris- ng the steps of: (a) setting the communication karaoke node; (b) selecting a desired song; (c) receiving the selected ong data; (d) determining whether an error is generated in ne selected song data; (e) processing the song data if an rror is not generated in the received song data in the step d); and (f) requesting retransmission of song data if an error s generated in the received song data in the step (d).

Also, according to still yet another aspect of the present nvention, there is provided an information data processing nethod for a communication karaoke mode of an intelligent elevision receiver for receiving a signal of a desired hannel, displaying the signal on a CRT, and transmitting nd receiving information data from a value added network, he method comprising the steps of: (a) setting the commu- ication karaoke mode; (b) selecting a desired song; (c) eceiving the selected song data; (d) determining whether he selected song data is received without an error; (e) rocessing the song data if the song data is received without n error in said step (d); (f) transmitting a code signal to nvalidate a counted service fee if an error is generated in the eceived song data; (g) canceling a transmission fee of the ong corresponding to the invalidated service fee; and (h) equesting retransmission of the sound data.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and advantages of the present invention vill become more apparent by describing in detail preferred mbodiments thereof with reference to the attached draw- ngs in which:

FIG. **1** is a diagram showing an intelligent television eceiver connected to a value added network according to ne present invention;

FIG. **2** is a block diagram of an intelligent television eceiver according to the present invention;

FIG. **3** is a detailed block diagram of an information processing unit shown in FIG. **2** according to an embodiment of the present invention;

FIGS. **4A-4B** illustrate a flowchart of an information data processing method performed by a CPU shown in FIG. **2**;

FIG. **5** is a detailed block diagram of an information processing unit shown in FIG. **2** according to another embodiment of the present invention;

FIG. **6** is a flowchart of an information data processing method for a karaoke mode according to an embodiment of the present invention, performed by a CPU shown in FIG. **5**;

FIG. **7** is a flowchart of an information data processing method for a karaoke mode according to another embodiment of the present invention, performed by a CPU shown in FIG. **5**;[and]

FIG. **8** is a detailed block diagram of an information processing unit shown in FIG. **2** according to still another embodiment of the present invention[ ] ; and

Fig. 9 is a block diagram of a television receiver according to an additional embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, an intelligent television receiver **10** has an information processing unit **50** for transmitting and receiving information data via a modem **300**, and decoding the information data received via the modem **300**, thereby providing a communication service.

Here, the modem **300** may be a distinct and separate component outside the information processing unit **50**. However, for convenience of explanation, the modem **300** is regarded as being internally constructed in the information processing unit **50**.

Also, the intelligent television receiver **10** is connected to a host computer **30** operated by a VAN operator for the communication service through a modem **20**.

FIG. **2** is a block diagram of an intelligent television receiver according to the present invention. Specifically, the intelligent television receiver includes an information processing unit **50**, a transmitter **54**, an infrared signal receiver **56**, a TV microcomputer **58**, a tuner **60**, an IF amplifier **62**, a first selector **64**, a video signal processor **66**, a second selector **68**, a CRT driver **72**, a deflector **74**, a sound signal processor **76**, and a third selector **78**.

The information processing unit **50** receives and decodes information data of a graphic or a text state when the intelligent TV is connected to a value added network (VAN).

The transmitter **54** has a communication mode key as well as various function keys and number keys for use in the television mode, and transmits an infrared signal when a key is pressed.

The infrared signal receiver **56** receives an infrared signal according to key inputs provided by the transmitter **54** and outputs the received signal to the information processing unit **50** and the TV microcomputer **58**.

The TV microcomputer **58** generates control signals for television signal processing in accordance with the infrared signal. Also, the TV microcomputer **58** transmits and receives data to and from the information processing unit **50**.

The tuner **60** selects a radio frequency (RF) broadcast signal received via an antenna under the control of the TV microcomputer **58** and converts the selected RF signal into an intermediate frequency (IF) signal.

The IF amplifier **62** amplifies the IF signal under the control of the TV microcomputer **58** and outputs the amplified signal as an IF video signal and an IF sound signal.

The first selector **64** has a first selection port a1 connected to a composite synchronization (sync) signal C_{sync} port of the information processing unit **50**, a second selection port b1 connected to an IF video signal port of the IF amplifier **62**, a selection control port connected to a control signal (GR SW) port of the information processing unit **50**, and an output port c1 which supplies the selected output to the input port of the video signal processor **66**.

The video signal processor **66** processes the signal selected by the first selector **64** under the control of the TV microcomputer **58** and outputs an RGB signal and horizontal and vertical sync signals H and V.

The second selector **68** has a first selection port a2 connected to an RGB signal port of the information processing unit **50**, a second selection port b2 connected to the RGB signal port of the video signal processor **66**, a selection control port connected to a blank control signal port of the information processing unit **50**, and an output port c2 which outputs the selected signal to a CRT **70**.

The CRT driver **72** drives the CRT **70** in accordance with the horizontal and vertical sync signals H/V from the video signal processor **66**.

The deflector **74** receives the horizontal and vertical sync signals H/V from the video signal processor **66** and supplies a deflecting current signal to the CRT **70**.

The sound signal processor **76** inputs the IF sound signal output from the IF amplifier **62** and outputs processed signals as left and right sound signals.

The third selector **78** has a first selection port a3 for receiving the left and right sound signals from the information processing unit **50**, a second selection port b3 for receiving the left and right sound signals from the sound signal processor **76**, a selection control port connected to a control signal SND SW from the information processing unit **50**, and an output port c3 which outputs the selected signals to a speaker **80**.

In FIG. **2**, a modem **20** and host computer **30**, which belong to the VAN operator's equipment, are included along with a telephone **52** which is not a component of the intelligent TV.

The operation of the intelligent television receiver shown in FIG. **2** will now be described.

If a user sets a communication mode using the transmitter **54**, the information processing unit **50** transmits a telephone number of the VAN operator to the modem **300**. The modem **300** dials the telephone number to connect the television to the host computer **30** through the modem **20** and the telephone line **40**.

When the television is connected to the host computer, if a communication command is input to the transmitter **54**, data communication between the host computer **30** and the information processing unit **50** of the television **10** is established.

At this time, a menu screen for selecting a desired communication item, for example, 1) news, 2) stock market quotes, 3) communication karaoke, etc. is displayed as an initial information screen, and the user selects the desired communication item from the menu screen.

The conversion into the communication mode is performed by pressing a communication key installed in the transmitter **54**. Also, the selection of the communication item is performed by using number keys or function keys of the transmitter **54**.

The information processing unit **50** decodes data received from the host computer **30** via the modem **20**, stores the

same in an internal memory and then displays the stored data on a screen. The telephone **52** is connected to the modem **300** of the information processing unit **50**, and the modem **20** detects on/off hooks, a key tone and key numbers of the telephone **52**.

The infrared signal receiver **56** receives an infrared signal corresponding to a key for setting a communication mode, a key for selecting a communication item or keys for a television mode and outputs the received signal to the information processing unit **50** and the television microcomputer **58**.

The television microcomputer **58** recognizes the function of the infrared signal output from the infrared signal receiver **56** to control the tuner **60**, IF amplifier **62**, video signal processor **66** and sound signal processor **76**, and transmits and receives serial data to/from the information processing unit **50**.

The tuner **60** receives a radio frequency (RF) signal via an antenna and selects the IF signal of a desired channel under the control of the television microcomputer **58** having recognized the infrared signal corresponding to the key input of the transmitter **54**. The IF amplifier **62** amplifies the IF signal of the selected channel and outputs the IF video signal and IF sound signal.

The first selector **64** selects the composite sync signal C_{sync} output from the information processing unit **50** or the IF video signal output from the IF amplifier **62** according to the control signal (GR SW) output from the information processing unit **50**. Specifically, when the information data is to be displayed entirely on the current screen, the composite sync signal C_{sync} is selected. When the television signal or the television plus information signals is to be displayed on the screen, the IF video signal of the IF amplifier **62** is selected.

If the IF video signal is selected in the first selector **64**, the video signal processor **66** processes the IF video signal to output an RGB signal and horizontal and vertical sync signals (H/V). If the composite sync signal C_{sync} is selected in the first selector **64**, the composite sync signal C_{sync} is separated and the horizontal and vertical sync signals (H/V) are output.

In other words, in the case of displaying the television or a television plus an information signal on the screen, the video signal processor **66** separates the RGB signal and the horizontal and vertical sync signals (H/V) of the television signal so that the RGB signal is output to the second selection port b2 of the second selector **68** and the horizontal and vertical sync signals (H/V) are output to the main controller **200**, CRT driver **72** and deflector **74**. In the case of displaying the information signal on the screen, the video signal processor **66** receives the composite sync signal C_{sync} from the main controller **200** (See FIG. **3**) and generates the horizontal and vertical sync signals (H/V) in synchronization with synchronized horizontal and vertical sync signals of the television signal by means of an internally installed automatic frequency adjusting circuit and phase-locked loop (PLL) circuit to output the signal to the main controller **200**, CRT driver **72** and deflector **74**.

In addition to the above-described functions, the video signal processor **66** also performs the adjustment of contrast, brightness and color under the control of the television microcomputer **58**.

The second selector **68** selectively switches the RGB signal output from the information processing unit **50** or the RGB signal output from the video signal processor **66** in accordance with the control signal BLANK output from the

information processing unit **50** to display the switched signal on the screen in the form of the information signal, television signal or television plus information signal.

The CRT driver **72** drives the CRT **70** in accordance with the horizontal and vertical sync signals (H/V) separated in the video signal processor **66**. The deflector **74** supplies a deflecting current signal for correcting convergence to the CRT **70** in accordance with the horizontal and vertical sync signals (H/V) separated in the video signal processor **66**.

The sound signal processor **76** processes the IF sound signal output from the IF amplifier **62** to output the left and right sound signals of the television signal. The sound signal processor **76** controls volume to mute the television sound signal under the control of the television microcomputer **58**.

The third selector **78** selects the sound signal output from the information processing unit **50** or the sound signal output from the sound signal processor **76** in accordance with the control signal SND SW output from the information processing unit **50** to output the selected signal via the speaker **80**.

In other words, in the case of the television mode, the third selector **78** outputs the television sound signal output from the sound signal processor **76** to the speaker **80**. In the case of the communication mode, the third selector **78** outputs the sound signal output from the information processing unit **50**. However, if the television mode is converted into the communication mode, the television sound signal output from the information processing unit **50** may be output as it is, or the sound signal for background music may be output. All sound signals may be programmed to be muted.

FIG. **3** is a block diagram of the information processing unit according to an embodiment of the present invention, shown in FIG. **2**.

In FIG. **3**, the information processing unit **50** includes a CPU **100** for controlling the overall system and carrying out the data transmission and operations using the program stored in a program ROM **110**. The program ROM **110** stores the program necessary for system control and various other kinds of data. A main controller **200** generates a control signal necessary for the operation of the overall system and for carrying out information data reception and display control and graphic data processing. A RAM/DAC **230** has a palette RAM for converting screen pixel data processed by the main controller **200** into RGB data and a digital-to-analog converter (DAC) for converting the RGB data read from the palette RAM into an analog signal. A volatile memory **210** reads/writes data received under the control of the main controller **200**. A storage memory **220** reads and writes the data stored in the volatile memory **210** under the control of the main controller **200**, and a modem **300** receives and transmits data to and from a host computer (not shown) via a telephone line under the control of the main controller **200**.

Now, the operation of the information processing unit shown in FIG. **3** will be described with reference to FIG. **2**.

In FIG. **3**, the CPU **100** controls the overall system and carries out the data transmission and operations using the program stored in a program ROM **110** in accordance with the control signal generated from the main controller **200**.

Data processing by the CPU **100** for peripheral function blocks is performed by interrupt signals, and the interrupt signals necessary for controlling the system CPU **100** are performed by the main controller **200**. The interrupt signals are generated by the modem **300** and various tasks in the main controller **200**.

Some examples of the tasks in the main controller **200** are the reception of an infrared signal input via the infrared signal receiver **56** in accordance with the input of keys installed in the transmitter **54**, a vertical blanking, the operation of an internal timer for a predetermined function and the input of serial data from the television microcomputer **58**. At this time, the main controller **200** generates the interrupt signal to be transmitted to the CPU **100**.

The CPU **100** processes the corresponding task whenever the interrupt signal is generated by the main controller **200**.

The program ROM **110** stores a program necessary for system operation, font data, various kinds of decoding programs and data. The CPU **100** reads data from the program ROM **110** to execute a group of operations therefor.

In other words, if a communication mode key is input, the main controller **200** recognizes the input to transmit the interrupt signal to the CPU **100** and then the CPU **100** performs the communication mode according to the program of the program ROM **110**.

The data for the telephone number according to the key input is recognized by the main controller **200** which is then transmitted to the CPU **100**. The CPU **100** transmits the telephone number to the modem **300**. Then, the modem **300** connects the information processing unit **50** to the value added network.

When the line is connected, a communication item is input using the transmitter **54**. If the data corresponding to the communication item is transmitted to the host computer **30** via the modem **300**, the host computer **30** transmits the information data according to the communication item.

When the information data received via the modem **300** is demodulated and then applied to the main controller **200**, the main controller **200** stores the data in a predetermined region of the volatile memory **210** and then reads the graphic signal for an information picture display, synchronized with the horizontal and vertical sync signals (H/V) output from the volatile memory **210**, to then be applied to the RAM/DAC **230**. The RAM/DAC **230** converts the applied signal into an analog signal and outputs the converted signal to the first selection port a**2** of the second selector **68**.

The main controller **200** generates a control signal necessary for the overall system and controls the write/read operations of the volatile memory **210** and storage memory **220**.

In other words, the main controller **200** receives the horizontal and vertical sync signals (H/V) generated in the video signal processor **66** for attaining the synchronization with the external video sync signal.

The main controller **200** receives the infrared data corresponding to the key input of the transmitter **54** via the infrared signal receiver **56** to then transmit the same to the CPU **100**, transmits the interrupt signal generated by the aforementioned internal tasks to the CPU **100**, recognizes the interrupt signal generated in the modem **300** to notify the CPU **100** of the interrupt signal, controls the graphic and video data processing and transmits the graphic data to the RAM/DAC **230**.

The main controller **200** supplies the composite sync signal C_{sync} generated by the internal sync signal generator to the first selection port a**1** of the first selector **64**. Also, the main controller **200** supplies the control signal GR SW for controlling the first selection port a**1** of the first selector **64** to which the composite sync signal C_{sync} is input to be selected in the case of displaying the information signal entirely on the screen, and for controlling the second selec-

tion port b1 to which the IF video signal output from the IF amplifier **62** to be selected in case of displaying the television signal or television plus information signal on the screen.

The main controller **200** supplies a control signal BLANK to the selection control port of the second selector **68**, such that the first selection port a2 of the second selector **68**, which inputs the RGB data of is the RAM/DAC **230**, is selected in the case of displaying an information signal entirely on the screen. The second selection port b2, which inputs the RGB data output from the video signal processor **66**, is selected in the case of displaying a television signal on the screen. In the case of displaying a superimposed television plus information signal on the screen, the first selection port a2 is selected only in the information data display section and the second selection port b2 is selected in the other section.

The main controller **200** outputs a control signal SND SW to the selection control port of the third selector **78** such that the second selection port b3, which inputs the television sound signal processed in the sound signal processor **76**, is selected in case of a television mode, and the television sound signal is muted in case of a communication mode. According to a first embodiment of the information processing unit, a separate sound signal for a communication mode is not input to the first selection port a3 of the third selector **78**.

Here, when the television mode is converted into the communication mode, the second selection port b3 of the third selector **78** is selected to output the television sound signal.

Also, the main controller **200** converts parallel data of a byte unit output from the CPU **100** into serial data for the interface between the CPU **100** and the television microcomputer **58** to transmit the serial data to the television microcomputer **58**, and converts the serial data received from the television microcomputer **58** into the parallel data of a byte unit to transmit the parallel data to the CPU **100**.

The volatile memory **210** and the storage memory **220** which are readable/writable memories, respectively, store the communication data. Here, the volatile memory **210** has a data storage region and a video refreshment region. In the data storage region, the information data of a screen is stored in the data storage region. The video refreshment region is used for superimposing the information data on the television signal. In other words, the information data stored in the video refreshment region corresponds to the superimposing position and then the stored data is read by the main controller **200** having the graphic processing function to then display the same on the CRT **70** via the RAM/DAC **230**.

The RAM/DAC **230** stores the color data to be displayed on the screen in the internal palette RAM. The color data is written to the palette RAM under the control of the CPU **100**, and when pixel data is transmitted from the main controller **200**, the RGB color data of the corresponding palette RAM are read and converted into analog signals to be output.

The modem **300** demodulates a modulated signal received through the phone line **40** to decode the demodulated signal for error correction and then stores the data in an internal buffer, generates and transmits an interrupt signal to the CPU **100** such that the received data is stored in the volatile memory **210**. Also, the modem **300** receives the digital data to be transmitted from the CPU **100**, and modulates and transmits the received data to the host computer **30** via the phone line **40**.

The modem **300** connected to the phone line **40** and the telephone **52** detects whether the phone is on or off the hook and detects key tones and transmits a key number to the CPU **100**. Also, the modem **300** detects key tone information input via the phone line **40** and decodes the same to then transmit the corresponding data to the CPU **100**.

FIGS. **4A–4B** illustrate a flowchart outlining the data processing method performed by the CPU shown in FIG. **3**, which will be explained with reference to FIGS. **2** and **3**.

In FIG. **4A**, the CPU **100** sets a communication mode corresponding to a key input of the transmitter **54** (step S10).

If the communication mode is set, a menu screen for communication options is displayed (step S11) and a desired communication option among the displayed communication options is selected using a function key or number key of the transmitter **54** (step S12).

If the communication option is selected, a telephone number is input using the number keys of the transmitter **54** for connection with the VAN (host computer). Then, the main controller **200**, having recognized the telephone number, generates the interrupt signal to transmit the same to the CPU **100**. The CPU **100**, having received the interrupt signal, transmits the telephone number data to the modem (step S13). The modem **300** dials the received telephone number to make connection with the host computer **30** (step S14).

At this time, when the connection with the host computer **30** is in progress, the main controller **200** displays the message "attempting to connect" on a part of the television screen via the RAM/DAC **230** so that the user may recognize the connection with the VAN being offered with a communication service.

The main controller **200** having a graphic processing function stores the message "attempting to connect" in the video refresh region of the volatile memory **210**, and reads the data stored in synchronization with the horizontal/vertical sync signals (H/V) output from the video signal processor **66** to output the read data to the RAM/DAC **230**. The RAM/DAC **230** converts the read graphic data into an analog RGB signal to display the message on the CRT **70**.

It is determined whether a line connection with the host computer **30** is completed (step S15). If the line is not connected, the attempt to connect is repeated a predetermined number of times (step S16). If the line is not connected after the predetermined number of attempts, a connection failure message is displayed on a predetermined region of the television screen (step S17).

If the connection is completed, the communication command for the selected communication item is transmitted to the host computer **30** via the modem **300** (step S18). The modem **300** receives information data in accordance with the communication command from the host computer **30** at a predetermined reception speed, demodulates and error-correction decodes the received data, and stores the same in the internal buffer (step S19)

The modem **300** stores the error-correction decoded data in the internal buffer. Then, if the buffer is full, the interrupt signal is generated and transmitted to the CPU **100** (step S20).

The CPU **100**, having recognized the interrupt signal, receives data from the modem **300** in the unit of 1 byte (step S21).

It is determined whether an error is generated in the received data (step S22) (See FIG. **4B**). If an error is generated in the received data, retransmission of the data is

requested to the host computer **30** via the modem **300** (step **23**) and the process is fed back to step S19.

If there is no error, it is determined whether the data transmitted via the modem **300** is the last data (step S24).

If the transmitted data is not the last data, the received data is written in the storage region of the volatile memory **210** of the CPU **100** (step S25) and then the process is fed back to step S21 to continuously receive data from the host computer **30** via the modem **300**.

However, if the data read from the modem **300** is the last data, i.e., if the data reception is completed, the received data is processed (step S26).

The data processing is performed such that the received data is read from the volatile memory **210** and stored in the storage memory **220** under the control of the main controller **200** and the data stored in the storage memory **210** is read to then be applied to the RAM/DAC **230** as graphic data.

The graphic data in the RAM/DAC **230** is output to the CRT **70** as an RGB signal to be displayed on the screen.

The RGB signal output from the RAM/DAC **230** is displayed on the entire screen under the control of the main controller **200** or is selectively switched together with the television signal output from the video signal processor **66** to be superimposed on a predetermined region of the television signal for display.

In other words, when the information content is displayed, only the information content may be displayed on a blue background screen with the television signal completely blocked. Otherwise, the information content may be superimposed on the screen with television information.

While the information content is displayed, it is continuously determined whether there is a key input from the transmitter **54** (step S27). If there is a key input from the transmitter **54**, the key data is decoded (step S28) to check whether the key data is normal (step S29).

If the key data of the transmitter **54** is not normal, an error message is displayed on the screen (step S30). If the key data is normal, it is determined whether the key data is a communication completion command (step S31).

If the key data is not the communication completion command, the key data is a communication control command. The communication control command is transmitted to the host computer (step S32). If the key data is the communication completion command, the line is disconnected (step S33) and the television screen reverts to the state that it was in prior to the communication mode and then the program for the communication mode is completed (step S34).

FIG. **5** is a circuit diagram of the information processing unit shown in FIG. **2** according to another embodiment of the present invention. In FIG. **5**, those parts which are the same as those corresponding parts of the information processing unit shown in FIG. **2** are designated by the same reference numerals, and their description will be omitted.

Referring to FIG. **5**, the program ROM **110'** includes a program for performing a communication karaoke function as well as the functions explained with reference to FIG. **3**.

In addition to the functions described in connection with FIG. **3**, a main controller **200'** controls a graphic ROM **410**, transmits data of a musical instrument digital interface (MIDI) format and commands to an accompaniment signal generator **400**, receives lyric (song) data and stores it in a volatile memory **210**, and then continuously moves the song data to a storage memory **220** to be stored therein if the song data is completely received. The storage memory **220** does

not lose the data even during a power-off and is capable of storing approximately 30 songs.

The accompaniment signal generator **400** receives various commands and MIDI data from the main controller **200'** in a serial data format and generates an accompaniment signal and outputs it to a first selection port a**3** of the third selector **78**. The accompaniment signal generator **400** stores the accompaniment signal of the MIDI data format depending on sound length, sound power and sound quality.

The graphic ROM **410** stores the compressed graphic data used as a background picture of the screen when the communication karaoke mode is selected. The CPU **100** reads the graphic data of the graphic ROM **410** and transmits it to the main controller **200'** to display a graphic image suitable to the song lyric according to the scenario information obtained by tabulating the homologous relationship between lyric contents among the data received from the host computer **30** and background graphics.

The main controller **200'** writes the graphic data in the video refresh region of the volatile memory **210**, reads the written graphic data according to the horizontal and vertical sync signals (H/V) output from the video signal processor **66** to then transmit the same to a RAM/DAC **230**. The RAM/DAC **230** outputs the graphic data as an analog RGB signal and displays it on the CRT **70**.

The operation of the information processing unit having the aforementioned configuration will now be described in terms of the communication karaoke function with reference to FIG. **6**.

The communication karaoke function allows a user to sing a desired song with the accompaniment by outputting a desired accompaniment and lyric data (hereinafter referred to as song data) transmitted from the host computer **30**.

For this purpose, the communication karaoke mode must first be set. The communication karaoke mode may be selected from the main menu screen of the information service using number keys. Alternatively, the communication karaoke mode may be selected by pressing a karaoke mode key separately provided in the transmitter **54**.

The first method is to display the main menu screen by inputting the communication mode key and then to select a karaoke option as one of the sub-menu options, from the main menu. The second method is to directly press the karaoke mode key for selection, whereby the line of the host computer **30** is connected to a karaoke service when the karaoke mode is selected.

Here, a line connection implies a state in which data transmission and reception are allowed by calling up a predetermined VAN operator and connecting the line with the host computer **30**.

If the communication karaoke mode is selected to connect the line, the user makes a reservation of a desired song number. The song number of the reserved song is input using number keys of the transmitter **54**, and multiple song numbers may be input as well. The song number input by the user is provided to the user in advance in the form of a pamphlet listing song numbers corresponding to available songs. New songs are continuously input to the host computer **30**, and a pamphlet containing new song information is periodically distributed to the user (typically once each month). The user inputs his or her desired song number from the distributed pamphlet.

When the user inputs the desired song number, the host computer **30** transmits the selected song data and the modem **300** receives, demodulates and error-correction decodes the selected data to then store the same in the internal buffer.

The song data, error-correction-decoded by the modem **300**, is read from the main controller **200'** and stored in the volatile memory **210**. The data is continuously stored in the storage memory **220** and when the storage for one song is completed, the stored data is decoded.

The graphic data stored in the graphic ROM **410** as the decoded scenario information is read and output as the background picture, and the decoded MIDI data is output to the accompaniment signal generator **400** which then outputs accompaniment music.

At this time, the song lyric is output prior to the background picture so as to be displayed on a part of the background picture.

During the communication karaoke mode, the song data for one song is received in one byte units whenever the modem interrupt signal is generated. If the song data for one song is received without error and is completely stored in the data storage region of the volatile memory **210**, the data stored in the volatile memory **210** is moved to the storage memory **220** and stored therein.

The intelligent television receiver provided with the communication karaoke function receives song information supplied by the VAN operator, displays it on the screen and outputs accompaniment music so that the user can sing the song.

The information data processing method for the communication karaoke mode will be described with reference to FIG. **6**.

FIG. **6** is a flowchart of an information data processing method for a karaoke mode according to an embodiment of the present invention, shown in FIG. **5**.

In FIG. **6**, if a karaoke mode is set by a key input of the transmitter **54** (step S**41**), the VAN is connected (step S**42**). Here, the connecting step (step S**42**) includes substeps S**13** through S**17**, as shown in FIG. **4**A.

If the VAN is connected, a desired song number is input (step S**43**).

When the song number is input, the modem **300** receives song data for the song selected from the host computer **30**, demodulates and error-correction decodes the received song data and stores it in the internal buffer (step S**44**).

At this time, the host computer **30** counts the fee for transmission of each song data and charges the service fee to the user's account.

The modem **300** generates a modem interrupt signal if one song data is completely stored in the internal buffer (step S**45**).

The CPU **100**, having recognized the modem interrupt signal, reads song data in one byte units from the modem **300** (step S**46**).

It is determined whether an error is generated in the song data while reading one song data from the modem **300** (step S**47**).

If it is determined that an error is generated in the song data received in step S**47**, retransmission of the error-bearing song data is requested (step S**48**) and the process is fed back to step S**44** for receiving song data from the host computer **30**.

If it is determined in step S**47** that the song data is received without error, it is determined whether the song data is the last data (step S**49**).

If the song data is the last data, which means a completed state of data reception of one song, the received song data is processed (step S**50**). If there is no reserved song, that is, if

the user selects only one song, the connection with the VAN is disconnected. If there is a reserved song, the transmitted song data is read out in the unit of one byte (steps **S50** and **S51**).

If the received song data is not the last data, the read data is stored in a predetermined region of the volatile memory **210** (step **S52**) and the address is increased (step **S53**) to then continuously store song data.

Here, the song data is sequentially stored in the volatile memory **210** whenever the data is received without error in one byte units.

If the data storage for one song is completed, the main controller **200** reads the song data stored in the volatile memory **210**, moves the song data to the storage memory **220** for storage, decodes the stored data, outputs the decoded MIDI data as the accompaniment music via the accompaniment signal generator **400** and reads the graphic data stored in the graphic ROM **410** as the decoded scenario information to then output the same as the background picture.

Here, the reason why the data stored in the volatile memory **210** is moved to the storage memory **220** to then be stored therein is as follows:

First, since much time is required for storing the received song data in the storage memory **220**, the song data is temporarily stored in the volatile memory **210** and is then moved and stored during each time interrupt. Here, the time interrupt is generated by an internal timer of the main controller **200**.

Second, during a power outage, the stored data is not lost.

Third, many favorite songs stored in the storage memory **220** can be directly read therefrom and output, rather than receiving the songs in the communication mode. This storage depends on the storage capacity of the memory **220**.

During the operation of moving the song data from the volatile memory **210** to the storage memory **220** and storing it therein, transmission of a reserved song is requested from the host computer **30** via the modem. When the data is received in the modem **300** from the host computer **30**, the modem **300** generates and transmits an interrupt signal to the main controller **200** to allow the CPU **100** to read the received data.

Therefore, the reserved song can be played immediately after a previous song is finished, which allows real time service.

In other words, after the reception of song data for a requested song is completed, if another song is reserved while the previously requested song is being played, the data of the reserved song is continuously received and stored in the volatile memory **210**. Then, when the reception of the reserved song is completed, the song is moved to and stored in the storage memory **220**. In this manner, once the play of the song is completed, the next reserved song can be played immediately.

Here, if the reception of all reserved songs is completed and the songs are stored in the storage memory **220**, the communication mode connection is terminated to suppress unnecessary VAN service fee payment.

Therefore, according to the present invention, in a state where the intelligent television receiver is connected to the VAN, the communication karaoke function is performed. Also, in a state where the connection with the VAN is terminated, the karaoke function for reserved songs can be performed.

FIG. **7** is a flowchart of an information data processing method for a karaoke mode according to another embodiment of the present invention, shown in FIG. **5**.

During a communication karaoke mode, the VAN operator typically charges the service charge to the user wherein the service charge is calculated on a payment basis for each song reception.

However, when the user's selected song data is transmitted from the host computer to the intelligent television receiver, errors may be generated by internal or external sources. If errors are generated during reception of the song data, the song data cannot be decoded or reproduced. Thus, the retransmission of the song data must be requested.

Here, since the VAN operator charges the transmission fee whenever a song data is transmitted, even if the song data is not accurately received due to the error, the user should pay the transmission fee.

The flowchart of FIG. **7** further comprises the steps **S61** and **S62** for eliminating the need to pay the transmission fee for the song data when an error in the song data is generated. The features will now be described in detail.

In FIG. **7**, when an error occurs in the song data read in a byte unit from the modem **300** in step **46**, the main controller **200** transmits a code signal for invalidating the counted fee to the host computer (step S61).

In other words, if the error transmitted from the host computer **30** is generated in the song data, a counted fee invalidating code signal for canceling the transmission fee for the requested but error-bearing song is transmitted from the main controller **200** to the host computer **30** via the modem **300**.

If the counted fee invalidating code signal is transmitted to the host computer **30**, the host computer **30** cancels the transmission fee of the error-bearing song from the counted transmission fee (step S62).

After the counted fee invalidating code signal is transmitted, retransmission of the song is requested and the process is fed back to step S44 (step S48).

FIG. **8** is a detailed block diagram of an information processing unit according to still another embodiment of the present invention, shown in FIG. **2**, in which the same components as those of the information processing unit shown in FIG. **5** are designated by the same reference numerals and the explanation thereof will be omitted herein.

In FIG. **8**, the background music generator **500** controls the operation of the main controller **200'** under the control of the CPU **100**. If the mode is converted into a communication mode so that the television screen is changed to the communication screen, the television sound signal is blocked and a sound signal for quiet background music is generated.

If the information screen is displayed during the converted communication mode, the main controller **200'** generates the control signal SND SW to mute the television sound signal, and controls the first selection port a3 of the third selector **78** for receiving the background music generated in the background music generator **500** as the sound signal to be selected.

At this time, the background music generator **500** is constituted by a one-chip ROM and controller. Here, a music program and data are stored in the ROM. Also, the controller allows real-time control.

Therefore, if the information is displayed in the communication mode, the background music generator **500** outputs quiet background music, instead of the television sound signal.

In other words, when the information screen is displayed, either a television sound signal or background music may be heard. Thus, when the information screen is converted, the